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Species of *Hygroceleuthus* and *Dolichopus*," with remarks on *Hygroceleuthus* by A. L. Melander and C. T. Brues; "On the Origin of the Sperm Blastophore of Some Aquatic Oligochæta," by S. Hatai; "Peculiar Tracheal Dilatations in *Bittacomorpha clavipes* Fabr.," by C. T. Brues; and "Lampreys in Captivity," by A. M. Reese.

BOTANY.

Alternation of Generations in Algæ.¹ — The author has made a careful study of the European forms of the Cutleriaceæ, a small but interesting group of algæ, and the results are given in this paper of one hundred pages. Two genera have been known in European waters, *Zanardinia* and *Cutleria*, the former represented by a single species, *Z. collaris*, the latter by two, *C. multifida* and *C. adspersa*. Each is represented by a sexual and an asexual form, in *Zanardinia* indistinguishable in habit, but in *Cutleria* so different that the asexual form was long known as a separate genus, *Aglaozonia*.

The paper begins with a thorough résumé of the previous investigations by Thuret, Reinke, Falkenberg, Janczewski, Kuckuck, and Church, which showed *Aglaozonia* to be included in the *Cutleria* cycle of development, assigning to *C. multifida*, *A. parvula*, and to *C. adspersa*, *A. chilosa*. The author has discovered a new form, *A. melanoidea*, occurring in the Mediterranean and on the Atlantic coast of Morocco, thus giving three sexual to two asexual forms. Though absolute proof has not been obtained, the author seems justified in regarding the new form as connected with *C. adspersa*, the sexual form corresponding to *A. chilosa* being yet to be discovered. As the asexual form of *C. multifida* has a farther range northward than the sexual form, it is not improbable that the sexual form of *A. chilosa* may be some little known tropical or subtropical species.

In studying the fertilization and development of *Cutleria* we find a curious complexity. The sexual form is dioecious; in many localities only the female plant is known, propagating freely by parthenogenesis; in some localities male plants are extremely rare; in others they occur in equal numbers with the female, or are even twice as common; but in only one place have cultures shown fecundation of the oöspore. In the locality where the male plant is most abundant

¹ Sauvageau, Camille. Les Cutlériacées et leur alternance de Générations, *Ann. Sci. Nat.*, Ser. 8, Botany, vol. x, pp. 265-362.

no trace of fertilization, or even of attraction between the antherozoids and spores, was found, but parthenogenetic growths were abundant. These growths were of two distinct types, both of which were found, only more fully developed, in plants growing in the sea, the two forms there growing intermingled, though not so in cultures. These forms the author designates, from their respective discoverers, as "forme thuretienne" and "forme falkenbergienne," the former producing first a "support," the summit of which is then transformed into a *Cutleria* frond, the latter a stout cellular cylinder, here called "colonnette," from the base of which grows out an *Aglaozonia* frond. It would seem that either of these forms may be produced by either *Aglaozonia* or *Cutleria* spores, in the latter case by either fertilized or unfertilized spores, so that, instead of a definite alternation of generations, as in ferns and mosses, either the sexual or the asexual form may reproduce itself for an indefinite number of generations, changing to the other under conditions unknown to us.

The "colonnette" is a peculiar development; the author regards it as an atavistic proembryo, representing what was a normal state in the remote history of the type, but is now only a survival, of no use to the individual. These three forms now found in the same species give the latter a wide range of affinities among the brown algæ, indicated by the author as follows: *Cutleria*, thallus with *Ectocarpus*, *Tilopteris*, *Carpomitra*; reproduction with *Tilopteris*, *Sphacelaria*. "Colonnette," thallus with *Myriotrichia*, *Litosiphon*; reproduction unknown. *Aglaozonia*, thallus with *Battersia*, *Sphacelaria*, *Zonaria*, *Padina*, *Dictyota*; reproduction with *Zonaria*, *Laminaria*. It is this wide range of affinities that makes the study of this little group of so much interest.

The paper is abundantly illustrated from excellent drawings by the author.

F. S. COLLINS.

Micro-Organisms and Fermentation.¹—The translation of the third edition of Dr. Jörgensen's well-known work on the subject, in which his word is one of authority, is doubtless a good service for many English-speaking readers. The general subject of fermentation is here so construed as to exclude decomposition changes; the chief phases treated dealing with those activities producing characteristically acetic, lactic, and butyric acids, slime, and alcohol. The

¹ Jörgensen, A. *Micro-Organisms and Fermentation*. Third edition, translated by Alex. K. Miller and A. E. Tennholm. London, Macmillan & Co., 1900. 318 pp., 83 figs.